MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

ECT1016 – CIRCUIT THEORY

(TE, RE)

21 OCTOBER 2017
2:30 PM – 4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 6 pages including cover page with 4 Questions only.

2. Attempt **ALL** the questions. The distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

a) The circuit in Figure Q1(a) is connected to a voltage source $E = 120V$. It is known that 144W is dissipated by R_3.

i. Solve for the total power delivered by the E. [2 marks]

ii. Determine the currents I_1, I_2 and I_3. [5 marks]

iii. What are the values of the unknown resistors R_2 and R_3? [4 marks]

iv. Calculate the power dissipated by R_1 and R_2. [4 marks]

v. Verify whether the total power dissipated by all the resistors is equal to the power delivered by the voltage source E. [2 marks]

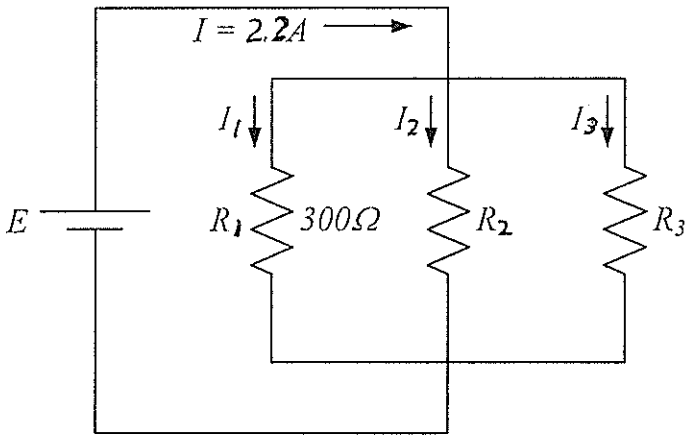

Figure Q1(a)

b) Determine the total resistance, R_T, and current, I, for the circuit in Figure Q1(b).

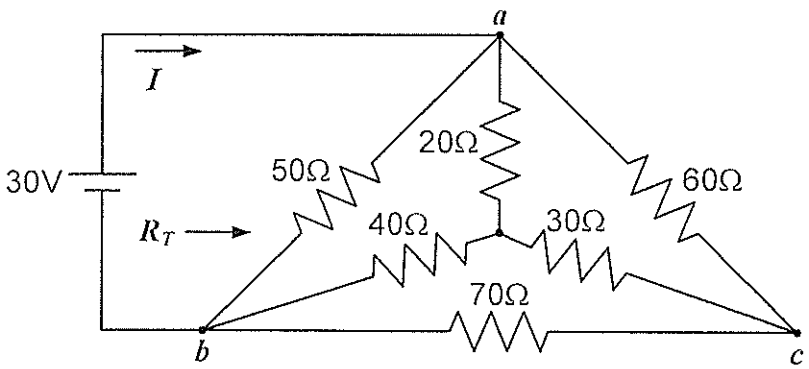

Figure Q1(b)

[8 marks]

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Question 2

a) Apply *mesh analysis* to determine the current I_{R2} in circuit of Figure Q2(a). [Hint: You might want to simplify the circuit first]

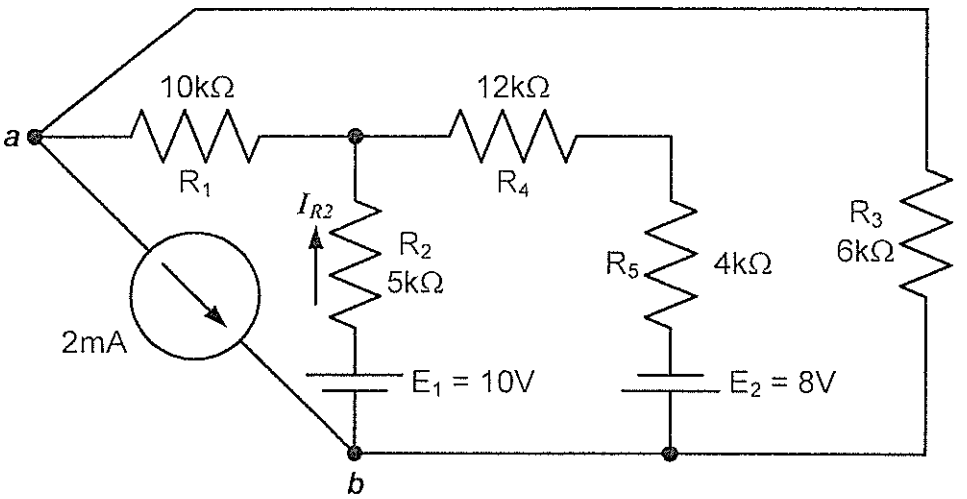

Figure Q2(a)

[9 marks]

b) i. Compute and draw the *Thevenin* equivalent circuit to terminal a-b of the circuit as shown in Figure Q2(b). [9 marks]

ii. What is the value of the load resistance, R_L, required to ensure that maximum power is transferred to the load? [1 mark]

iii. Determine the voltage, current and power dissipated across R_L. [6 marks]

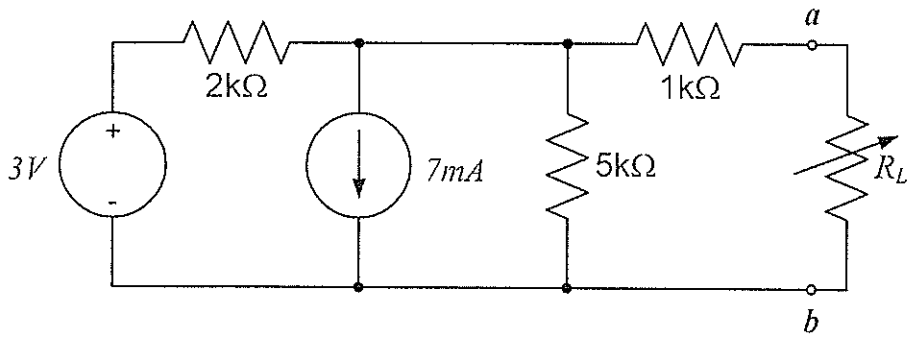

Figure Q2(b)

Continued...

Question 3

a) An RLC series circuit consists of a 100Ω resistance, a 50mH inductor and a 10pF capacitor. If a voltage source of 50V is applied to the combination, calculate the
   i. resonance frequency. [2 marks]
   ii. Q-factor of the circuit. [2 marks]
   iii. half power bandwidth. [2 marks]

b) A series RLC circuit is shown in Figure Q3. Determine
   i. current, I. [7 marks]
   ii. V_1 and its vector diagram. [8 marks]
   iii. the overall power factor. [4 marks]

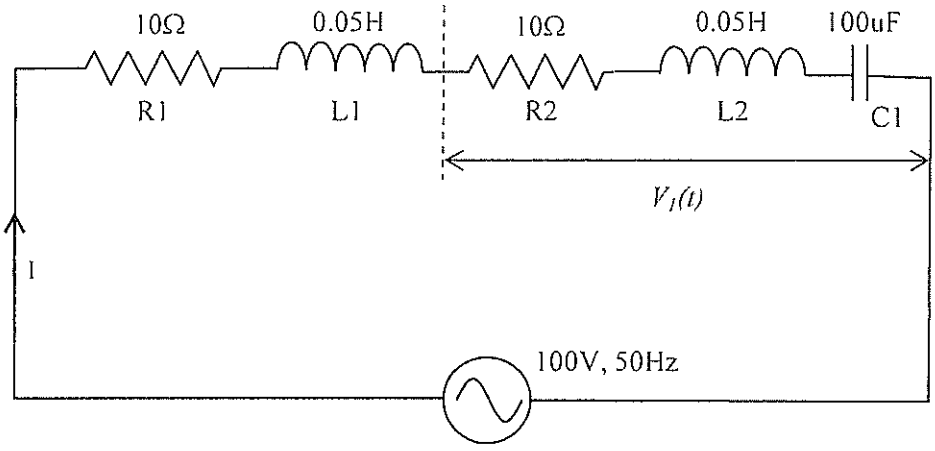

Figure Q3

Continued...

Question 4

a) A coil having a resistance of 10Ω and an inductance of 0.1H is connected across a battery of 10V as shown in Figure Q4(a).

i. Determine the current, $i(t)$ in the circuit when switch, S is closed after $t = 0$. [5 marks]

ii. Sketch the graph of the current vs time [$i(t)$ vs t] in the circuit. [2 marks]

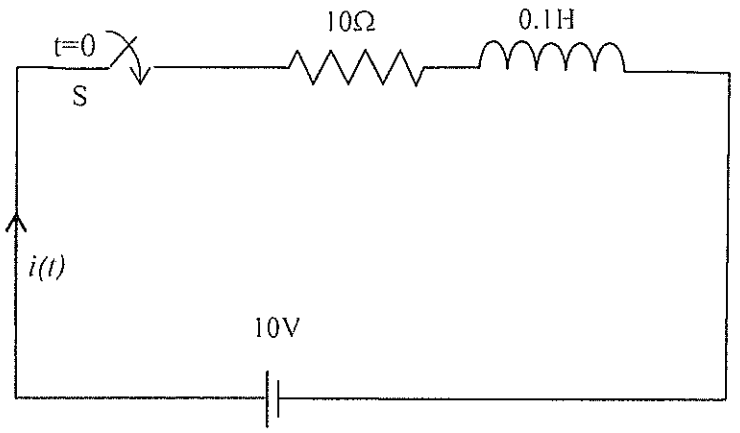

Figure Q4(a)

b) A coil of 10H inductance and 10Ω resistance are connected in parallel with a 10Ω resistor and a 100V dc supply as shown in Figure Q4(b). The switch that connects the dc supply is opened at t = 0. Determine the

i. current, $i(t)$ in the circuit. [5 marks]

ii. voltage across R_1 at t = 0 and t = 0.3s. [5 marks]

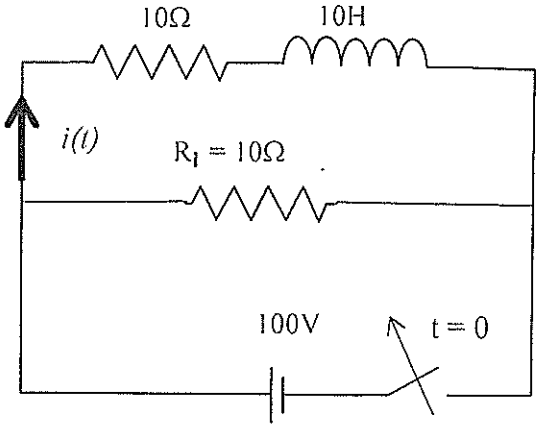

Figure Q4(b)

Continued...

c) Determine V_C, V_X and i_X for t > 0 as shown in Figure Q4(c). Assume $V_C(0) = 10V$.

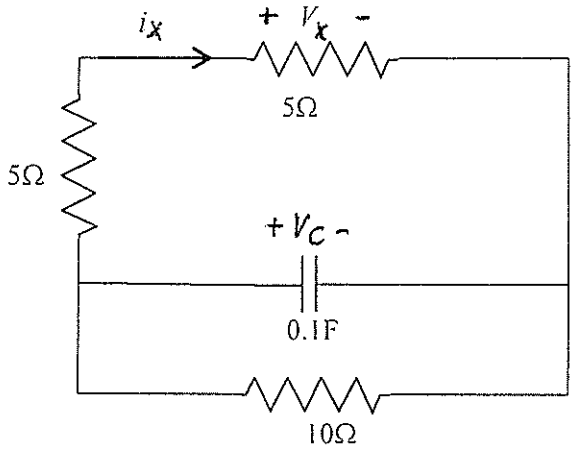

Figure Q4(c)

[8 marks]

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